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TOP LOADING FIXED LINE TRIMMER HEAD

BACKGROUND

Weed and grass trimmers have been developed which employ a rotatable hub, with a short length of flexible nylon or other plastic line extending from the hub. When the hub is rotated (typically, at speeds from 6,000 RPM to 12,000 RPM), the tip of the line extending from the hub provides the cutting or trimming action. Weed and grass trimmers using this principle of operation have become popular for their versatility of use, and because the flexible trim line is safer to use than rigid rotating steel blades.

Various types of devices have been developed for using such trimmer lines. Typically, rotating line trimmers or rotating string trimmers employ a line which generally has a circular cross section. In many hand-held trimmers, the line is wound on a storage reel in the hub of the device, and is fed out of a hole in the hub in discrete amounts, as the end wears off or breaks off. Trimmers of this type sometimes are referred to as "bump-and-feed" trimmers, since, when the line breaks off, the bottom of the storage reel is bumped on the ground to cause a spring release of the line within the trimmer. A short length of line then is played out through a hole in the hub by means of centrifugal force when the trimmer is operating. Typically, bump-and-feed string trimmers use relatively small diameter line, normally in the range of 0.065" to 0.080" diameter, since the smaller diameter flexible

1 line functions better for the centrifugal feeding of a bump-and-
2 feed head.

3 Generally, heavier diameter line (for example, 0.115" to
4 0.160") is too stiff for winding and for the centrifugal feeding
5 used in bump-and-feed heads. An advantage of bump-and-feed heads
6 is that less frequent reloading of the line, theoretically, is
7 required than for trimmers using short segments of a predetermined
8 length.

9 A problem exists, however, with bump-and-feed trimmers in that
10 frequently the line which is wound tends to become stuck, either
11 due to partial fusion of the line within the hub, caused by high
12 frequency vibration, or by successive turns of the line wound on
13 the hub becoming somewhat entangled. As a result, feeding of the
14 line from the hub, when desired, does not always take place. When
15 this occurs, it is necessary to remove the hub from the string
16 trimmer device and manually extract the desired length of line,
17 prior to re-attaching the hub to the device. This is a time
18 consuming and frustrating experience for many users of flexible
19 line string trimmers.

20 For commercial use, employing relatively large diameter lines,
21 for example 0.115" to 0.160" diameter, fixed length line or cut
22 line trimmer heads usually are employed. The large diameter
23 monofilament nylon lines are particularly useful where weed and
24 grass growth is dense. The large diameter lines also provide
25 longer length of service before the line needs to be replaced. A
26 type of heavy duty machine which has been designed for commercial

1 use is a high-wheeled machine, where the motor and operating
2 mechanism is carried between a pair of wheels. The trimmer head
3 extends forward of the wheels, and then downwardly toward the
4 ground, where relatively large diameter fixed or cut lengths of
5 line are inserted into the trimmer head for effecting the trimming
6 operation.

7 In most cases, either for standard hand-held gas or electric
8 trimmers, or for high-wheeled commercial brush trimmers, when line
9 is to be reloaded, the unit is at rest with the head facing upward.
10 Most trimmers require bottom or side loading. This requires the
11 machine to be tilted upwardly. This is awkward and the machine is
12 heavy to hold. In addition, because of the inverted position of
13 the machine, the possibility of gasoline spillage is ever present.

14 Bottom loading machines also preclude the utilization of
15 replaceable ground spacers of different heights, since such ground
16 spacers need to be attached to the underside of the head. Another
17 disadvantage, particularly with commercial machines, is that the
18 heavy duty line which is used is difficult to bend and load into
19 the machines. A popular machine employs three closely arrayed
20 semi-circular loops secured to the face of the trimmer head, near
21 its perimeter. To replace line, it must be passed through the
22 three loops in a generally knotted configuration to extend both
23 ends of a fixed cut length of line outwardly from the same side of
24 the head. The sharp bends which are required for insertion of the
25 line make both insertion of a new line and removal of a depleted
26 line difficult, particularly when the larger sizes of line

1 mentioned above are used with such a machine.

2 The United States patent to Fogle No. 6,035,618 is directed to
3 a fixed line trimmer head for overcoming the disadvantages present
4 in conventional bump-and-feed heads, and also for permitting use of
5 lines of different diameters in the same trimmer head. The Fogle
6 head, however, requires loading and replacement of the line from
7 the bottom or underside of the head, thus causing it to be subject
8 to the disadvantage of awkward bottom loading, for the reasons
9 discussed above.

10 It is desirable to provide an improved fixed length line
11 trimmer head for string trimmer machines, which overcomes the
12 disadvantages of the prior art, which may be loaded from the top,
13 which is capable of utilization with lines of different diameters,
14 and which securely holds fixed segments of line in place during
15 use.

16 SUMMARY OF THE INVENTION

17 It is an object of this invention to provide an improved
18 trimmer head for string trimmer machines.

19 It is another object of this invention to provide an improved
20 fixed line trimmer head for string machines.

21 It is an additional object of this invention to provide an
22 improved fixed line trimmer head for string trimmer machines in
23 which the line is simple to install and replace.

24 It is yet another object of this invention to provide an
25 improved fixed line trimmer head for string trimmer machines
26

1 capable of use with lines of different diameters.

2 It is a further object of this invention to provide a top
3 loading fixed line trimmer head for string trimmer machines which
4 is easy to load with trimmer lines, and which employs locations of
5 line exit openings and line termination apertures designed to
6 firmly hold the line in place during use, and to facilitate rapid
7 removal of line which is to be replaced.

8 In accordance with a preferred embodiment of the invention, a
9 top loading fixed line trimmer head for string trimmer machines
10 employs a central cylindrical hub having an upper end for
11 attachment to a drive shaft of a string trimmer machine, and having
12 a lower end. A circular flange is attached to, and extends
13 outwardly from, the lower end of the central hub. The circular
14 flange has trimmer line exit openings on the circumference thereof.
15 A line guide channel is located between the line exit openings in
16 the circular flange and openings on the upper surface of the flange
17 to guide line to line termination apertures or grooves located on
18 either the hub or the flange, and angularly offset from the trimmer
19 line exit openings, to securely hold a segment of line in place.

20 BRIEF DESCRIPTION OF THE DRAWINGS

21 Figure 1 is a top perspective view of a preferred embodiment
22 of the invention;

23 Figure 2 is a cross-sectional view of the embodiment shown in
24 Figure 1;

25 Figure 3 is a top view of the embodiment shown in Figure 1;
26

1 Figure 4 is a side view of a portion of the embodiment shown
2 in Figure 1;

3 Figure 5 is a top perspective view of another embodiment of
4 the invention;

5 Figures 5A through 5D illustrate operating features of the
6 embodiment shown in Figure 5;

7 Figure 6 is a top perspective view of another embodiment of
8 the invention;

9 Figure 7 is a detail of the portion marked "7" in Figure 6;

10 Figure 8 is a top perspective view of another embodiment of
11 the invention;

12 Figure 9 is a top perspective view of another embodiment of
13 the invention;

14 Figure 10 is a side view of the embodiment of the invention
15 shown in Figure 9;

16 Figure 11 is a top view of the embodiment shown in Figure 9;

17 Figure 12 is a top perspective view of a variation of the
18 embodiment shown in Figure 9;

19 Figure 13 is a top view of another embodiment of the
20 invention; and

21 Figure 14 is a top perspective view of another embodiment of
22 the invention.

23 DETAILED DESCRIPTION

24 Reference now should be made to the drawings, in which the
25 same reference numbers are used throughout the different figures to
26 designate the same or similar components. Figures 1 through 4 are

1 directed to a preferred embodiment of the invention as applied to
2 a top-loading, fixed length line trimmer head for a string trimmer
3 machine. The trimmer head which is illustrated in Figures 1
4 through 4 may be used in conjunction with either a hand-held
5 trimmer or a high-wheeled brush trimmer. The principles of
6 operation of the head are identical in either application.

7 In the embodiment shown in Figures 1 through 4, the trimmer
8 head itself comprises an upward extending central cylindrical hub
9 terminating at its lower end in a circular flange 20. The hub
10 itself has a central aperture 32 located in it for receiving a bolt
11 36 (Figure 2), which is threaded upwardly through the opening 32 to
12 attach the trimmer head to the drive shaft mechanism of a hand held
13 trimmer or a high wheeled trimmer. Connection of the trimmer head
14 20 with the drive mechanism of the string trimmer machine with
15 which it is used may be effected in any suitable manner; and the
16 illustration of the bolt 36 merely is indicative of one such means
17 of connection. Other standard techniques for connecting the hub of
18 the trimmer head to the drive mechanism of the trimmer machine may
19 be used, as well as the one which is specifically shown in Figure
20 2.

21 In the embodiment shown in Figures 1 through 4, the upper head
22 portion, consisting of the central hub and the circular flange 20,
23 preferably is made of metal; and the bolt 36 is used to attach a
24 domed spacer 22 to the bottom of the metal head portion,
25 simultaneously with the connection of the assembly by means of the
26 bolt 36 to the drive mechanism of the string trimmer machine. This

1 is most readily evident from an examination of the partially
2 exploded view of Figure 2 showing the parts prior to their complete
3 assembly. When the parts are completely assembled they assume the
4 configuration shown in Figure 1, with an outer lip of the domed
5 spacer 22 extending around the periphery of the edge of the
6 circular flange 20 of the hub portion. This protects the metal
7 flange 20 from abrasive wear in the event the assembled trimmer
8 head strikes posts, walls, rocks or the like during operation.
9 Instead, such wear takes place on the plastic domed spacer 22,
10 which may be readily replaced, if it is damaged or broken. It also
11 should be noted that the spacer 22 may assume configurations having
12 greater or lesser depth than the one shown in Figure 2; so that the
13 trimmer head may be adapted to spacing the ends of the cutting
14 lines at different distances above the ground, in accordance with
15 the configuration of the spacer 22.

16 Whether the spacer 22 has the relative dimensions shown in
17 Figure 2 or is shallower or deeper than the one shown in Figure 2,
18 it includes, on its upper surface channels 28 and flared exit
19 openings 30. The channels 28 mate with corresponding undercut
20 channels 26 in the circular flange 20 of the head. When the parts
21 are fully assembled to cause the upper end of the cylindrical hub
22 34 of the spacer 22 to engage the lower side of the top of the hub
23 adjacent the hole 32, the undercut channels 26 in the circular
24 flange mate with the open channels 28 in the spacer to provide
25 generally circular channels for guiding and accommodating string
26 trimmer line.

1 In contrast to the conventional manner of utilizing fixed
2 lengths of string trimmer line, or in bump-and-feed string trimmers,
3 the trimmer line 50 used in conjunction with the head shown in
4 Figures 1 through 4 comprises short lengths which terminate at one
5 end in one of four upstanding longitudinal flanges 40, which
6 preferably are perpendicular to the upper surface of the circular
7 flange 20. This is shown most clearly in Figures 1, 2 and 4.

8 As indicated in Figures 1 through 4, four flanges 40 are
9 provided, spaced at intervals around the circular central hub of
10 the metal head portion. The flanges 40 extend parallel to the
11 central axis of the hub, and each of them includes three different
12 sized holes 42, 44 and 46, spaced along the length of the flange,
13 as shown most clearly in Figures 2 and 4. As is readily apparent
14 from an examination of Figures 2 and 4, holes 42 are the largest,
15 the holes 44 are intermediate in size, and the holes 46 are the
16 smallest. These holes are sized to accommodate string trimmer
17 lines of three different external diameter ranges. The smallest
18 hole 46, for example, may be employed to accommodate the insertion
19 of relatively small diameter trimmer line (on the order of 0.065"
20 to 0.080" diameter). The hole 46 is selected to be just slightly
21 larger than the larger of these two small diameters. For heavier
22 line, the holes 44 are designed to allow the insertion of mid-sized
23 diameter lines; and the holes 42 are dimensioned to allow the
24 insertion of the largest diameter line, typically 0.160" in
25 diameter. This allows the head to be used in a machine with the
26 diameter of line chosen for the particular application with which

1 the machine is used at any particular time. Once the proper
2 diameter has been selected, the end of the line is inserted through
3 the appropriate one of the openings 42, 44 or 46, as shown most
4 clearly in Figures 1 and 3. The opposite or free end, which will be
5 the cutting end, is inserted downwardly through a guide channel 24
6 formed through the top of the circular flange 20 to open into the
7 channel between the portions 26 and 28 to permit the line 50 then
8 to extend outwardly through the flared opening 30, as shown in
9 Figures 1 and 3.

10 In the embodiment shown in Figures 1 through 4, anywhere from
11 one to four line segments 50, attached as shown in Figures 1 and 3
12 may be utilized. It is readily apparent that the replacement of a
13 worn line 50 is quickly and easily effected for all diameters, from
14 the smallest to the largest. It is a relatively simple matter to
15 insert one end of the line first into the transverse holes (42, 44
16 or 46) through the flanges 40, as described, and then push the
17 other end of the line 50 downwardly through the openings 24, and
18 then outwardly through the flared exit openings 30.

19 It should be noted that the flared exit openings 30 through
20 the plastic spacer 22 may have a metal ferrule in them to reduce
21 the chances of plastic fusion between the line and the edges of the
22 openings 30 due to high frequency vibrations. The spacer 22 may be
23 made of a hard plastic material, but it also could be made of
24 metal, if desired. For most operations, the utilization of hard
25 plastic for the portion 22 is preferred.

26 When a line segment 50 has become shortened through wear or

1 breakage, so that it needs to be discarded, it is a simple matter
2 to remove the unused portion by reversing the steps quoted above,
3 or simply pulling the line at the bight where it is inserted into
4 the hole 42/44/46, and then pulling it out of the guide opening 24.

5 Initially, it would appear that a trimmer line 50 inserted
6 into the head, as described above, would not be firmly held in
7 place. It has been found, however, that when centrifugal force on
8 the line 50 causes it to draw outwardly, particularly when it
9 strikes various objects in operation of the head, a tight pull in
10 the outward direction from the exit openings 30 causes the bight or
11 bend in the line, at the place where it is inserted through the
12 holes 42, 44 or 46 (oriented substantially 90° to the path of the
13 line through the channel 26/28 and out of the opening 30) causes
14 increased friction between the edge of the hole and the line to
15 prevent pulling the line 50 out of the holes 42/44/46. In fact,
16 the greater the pull, the tighter is the hold of the line in the
17 holes 42/44/46. Outward pulling force applied to the line 50
18 typically will break the line somewhere along its length before the
19 line can be pulled out of the hole 42/44/46, once it is inserted
20 into the proper sized hole, as described above. By offsetting the
21 direction of the axis of the holes 42/44/46 from the generally
22 radial direction of the exit of the line 50 from the head, the
23 excellent holding force described above is obtained. Clearly, the
24 ears or flanges 40 do not need to be perpendicular to the plate 20
25 or oriented parallel to the longitudinal axis of the hub of the
26 metal portion 20 of the head. The flanges 40 may be oriented at

1 some other angle. The operation would be the same as described
2 above for the embodiment specifically shown in Figures 1 through 4.

3 Figure 5 illustrates a variation of the embodiment shown in
4 Figures 1 through 4. In Figure 5, the upper metal portion of the
5 head is shown with a hub 62 and a lower circular flange 60, which
6 is comparable to the construction of the upper portion of the head
7 of Figures 1 through 4. The head 60/62 has a circular aperture
8 opening 32 in it for attachment of a spacer plate 22 and a bolt 36
9 in the same manner as described previously in conjunction with
10 Figures 1 through 4. In the embodiment shown in Figure 5, however,
11 no flanges or ears 40 are placed on the outer periphery of the hub
12 62. Instead, there is a termination hole or short channel 68
13 placed adjacent each of the channels 64 in the top of the plate 60.
14 The channels 64 correspond to the channels 24 in the top of the
15 plate 20.

16 Reference should be made now to Figures 5A through 5D for the
17 manner in which the line 50 is inserted, terminated and held in
18 place in the embodiment of Figure 5. As shown in Figure 5A, the
19 terminating end of the line 50 is inserted through a flared exit
20 opening 66 and extends upwardly and out of the channel opening 64,
21 which cooperates with an internal channel in the plate 20. This
22 internal channel may be formed in any suitable manner, including
23 the manner in which the channel 26/28 is formed in the embodiment
24 of Figures 1 through 4.

25 Once the line is inserted as shown in Figure 5A, it then is
26 pulled outwardly a short distance, as shown in Figure 5B. After a

1 sufficient length of the line has been pulled outwardly, it then is
2 turned as shown in Figure 5C, and inserted into the hole or channel
3 68 formed adjacent the opening 64. This places a generally "S-
4 shaped" curvature in the line. Again, as with the embodiment of
5 Figures 1 through 4, if extensive force is placed on the line in
6 the direction of the lower arrow shown in Figure 5D, it tightly
7 pulls into place against the edge of the channel 68 to resist any
8 removal of the line by pulling it in that manner. To remove the
9 line, the line is pushed inwardly, as shown in Figure 5A, to loosen
10 the bight in the line; and then the end which is inserted into the
11 channel 68 easily may be pulled out with the fingers. The
12 operation of the embodiment of Figures 5, however, is identical to
13 that of the embodiment shown in Figures 1 through 4.

14 Again, in the embodiment of Figure 5, segments of line are
15 "end terminated" and then extend outwardly through the flared outlet
16 channels 66 in the same manner line extends from the channels 30 in
17 the embodiment of Figures 1 through 4. The head of Figure 5 may be
18 used with or without the spacer 22. It also should be noted that
19 if no spacer 22 is desired with the head of Figures 1 through 4, a
20 different channel arrangement on the underside of the circular
21 plate 20 may be employed to guide the line outwardly through the
22 exit openings 66 shown in Figure 5.

23 Figures 6, 7 and 8 are directed to another alternative
24 embodiment of the invention described in conjunction with Figures
25 1 through 5. Again, many of the elements of the head of Figures 6,
26 7 and 8 are similar to those described previously; so that a

1 detailed description of those common elements is not considered
2 necessary here. Figure 6 shows the upper metal portion of the head
3 being made in the form of a spoked wheel, with spokes 70 attached
4 to a central hub 76, rather than in the form of a solid circular
5 disk, as shown in Figures 1 and 5. It should be noted that the
6 embodiments of Figures 1 and 5 also could use spoked wheels,
7 instead of solid circular disks, without changing the other
8 functions of those embodiments.

9 In the embodiment shown in Figure 6, each of the spokes 70 of
10 the wheel has a flared outlet or exit opening 30 cooperating with
11 an inner channel (not shown in these figures), which opens into a
12 top opening 24 in each of the four spokes 70. The hub 76 has a
13 widened shoulder 74 on it, with a plurality of short holes 82/84/86
14 (Figure 7) formed in it.

15 The holes 82/84/86 serve the same function and purpose as the
16 holes 42/44/46 of the embodiment of Figures 1 through 4. Instead
17 of passing all the way through the widened shoulder 74 on the hub
18 76, however, the holes extend part way a sufficient distance to
19 allow the end of the trimmer line 50 to be inserted into the
20 appropriately sized hole in the manner shown in Figures 6 and 7.
21 The line is held in place in the same manner described above for
22 the embodiments of Figures 1 through 5 by virtue of the sharp bend
23 at an angle to the general direction of the exit of the line 50
24 from the exit openings 30, as shown in Figures 6, 7 and 8.

25 It also should be noted that anywhere from one to four lines
26 may be used with the embodiments of Figures 6 and 8. Greater

1 numbers of line segments 50 may be employed; although typically,
2 string trimmer machines do not use more than four. Generally, such
3 machines use either two or four lines; but any number of lines can
4 be employed. The utilization of diametrically opposite or
5 symmetrically disposed lines produces lower vibration of the
6 rotating head; but odd or even numbers of lines may be employed as
7 desired.

8 In the embodiment of Figure 8, a different configuration from
9 that shown in Figure 6, but using the same general operating
10 principles, is indicated. In the embodiment of Figure 8, the spacer
11 plate 22 is used to form a channel on the bottom of the circular
12 flange 90 to accommodate a line passing upwardly through the
13 shoulder portion 94 (similar to the shoulder 74 in the embodiment
14 of Figure 6). The line then is turned and pushed downwardly into
15 an adjacent hole on one or the other side of the channel 98,
16 through which it passes. In utilizing the embodiment shown in
17 Figure 8, however, typically only two different line size ranges
18 are employed, instead of the three different ones which are
19 possible with the embodiments of Figures 1, 5 and 6, for example.
20 The operating principles, however, are the same; and the embodiment
21 of Figure 8 is similar to the one of Figure 6, both in structure
22 and in operation. Again, the holes 82/84/86 or 100/102 of the
23 embodiments of Figures 6 and 8 are oriented at an inclined angle to
24 the exit direction of the line 50 through the exit openings 30 to
25 ensure a tight pulling and holding of the line in place during
26 operation of the trimmer head.

1 Figures 9, 10 and 11 are perspective side and top views,
2 respectively, of another embodiment of the invention where a single
3 length of cut line is extended through the trimmer head from one
4 side to another, to extend on diametrically opposite sides of the
5 head. In the embodiment of these figures, the general
6 configuration of the utilization of a central hub 118 and a spoked
7 wheel 108, with spokes 106 in it, is similar to the configuration
8 of Figure 6.

9 A replaceable spacer 114 is attached to the bottom of the
10 spoked wheel 108 by means of flexible snap extension or spring
11 extensions 116, which extend upwardly through corresponding
12 apertures 112 in diametrically opposed ones of the spokes 106 in
13 the head which is illustrated. The spacer 114 may be replaced with
14 spacers of greater or lesser depths, as described above in
15 conjunction with the spacer 22. By utilizing a connection of the
16 spacer 114 through the spring clips 116 extending from it, the bolt
17 36 (Figure 2), which extends upwardly through the bottom of the
18 spacer 114, secures only the upper portion 108/106/118 to the
19 machine drive shaft. Or, a connection to the opening 32 from the
20 drive shaft of the string trimmer machine may be effected in some
21 other manner, from the top. The manner in which the trimmer head
22 is attached to the machine is not important to an understanding of
23 the invention; but it is desirable to show that various
24 configurations may be used while employing the same principles. It
25 should be noted that the manner of connecting the spacer 114, as
26 shown in Figures 9, 10 and 11, could also be used in conjunction

1 with the embodiments of Figures 1 through 8, described previously.

2 In the embodiment shown in Figures 9, 10 and 11, two pairs of
3 corresponding ears 120 and 122 are provided on opposite sides of
4 the central hub 118. These ears have holes 121 through them (for
5 the ears 120) and 123 through them (for the ears 122). The holes
6 121 are smaller than the holes 123; so that when a range of smaller
7 diameter line is employed with the head, it is threaded through
8 holes 121 in the manner shown in Figure 9 from one exit opening
9 110, on one side of the head, to an opening 110 on another part of
10 the head (most clearly shown in Figure 9). Thus, a single cut
11 length of line 126 extends through the entire head, rather than
12 separate lengths of line which have an end terminated in the head,
13 as shown in the embodiments of Figures 1 through 8.

14 The orientation of the ears 120 and the holes 121 through
15 them, or the ears 122 and the holes 123 through them, is such that
16 the same operating principles described above in conjunction with
17 Figures 1 through 8 apply. When an outward centrifugal pulling
18 force is placed on the line 126, in either direction, pulling
19 outwardly from one or the other of the flared openings 110 on
20 opposite sides, the snake-like path which is taken by the line 126
21 through the holes 121 or 123, causes the bend of the line 126 at
22 the holes, as the line attempts to wrap around or straighten around
23 the hub 118, to tighten and firmly grip the line, preventing it
24 from being withdrawn in this manner. The embodiment of Figures 9,
25 10 and 11 is capable of use with line sizes in two or more general
26 ranges (small or large).

Figure 12 illustrates a variation of the embodiment shown in Figures 9, 10 and 11. In Figure 12, in place of two sets of ears, such as 120 or 122 in the embodiment of Figures 9 through 11, a somewhat larger block set, such as 140A, 140B, or 142A, 142B, is employed. In the embodiment of Figure 12, it also is possible to have line extending from four different angularly oriented positions on the head in the manner disclosed in conjunction with Figures 1 through 8. A hole (or holes) is provided through each of the blocks 140A, 140B, 142A and 142B. The blocks 140B and 142B each may be configured with a smaller diameter hole, such as the holes 121 described above in conjunction with the embodiment of Figures 9 through 11. Similarly, the blocks 140A and 142A are drilled or formed with a larger diameter hole 146 to accommodate larger diameter line. Line 126 then is strung from one side of exit opening 110 through the appropriate hole 144 or 146 in the block which is positioned essentially half-way between the exit openings 110, in the manner illustrated in Figure 12. Similarly, on the spokes of the wheel 108, which are shown oriented at 90° to the first set, a second line 128 is drawn and passed through the openings 146 or 144, in either the block 142A or 142B, which has an opening through it appropriate for the line size 128 being used. The orientation and the manner in which the line is placed in the head is the same as described above in conjunction with Figures 9 through 11. The operation is the same as in the embodiment of Figures 9, 10 and 11.

A final embodiment of the invention is illustrated in Figures

1 13 and 14, in two slightly different configurations. In this
2 embodiment, the principles which are utilized in conjunction with
3 the embodiments of Figures 9 through 12 also are employed. In the
4 embodiment shown in Figure 13, however, a top plate 150 has an
5 upward hub 152 with the central opening 32 in it for attachment to
6 the drive mechanism of a string trimmer machine, as described
7 previously. A spacer plate 154, which may be similar to either of
8 the types of spacer plates 22 or 114 described above, is employed,
9 and operates in the same manner with the top portion 150/152, as
10 described previously. A line 126 extends from an exit opening 156
11 on one side of the plate 152 and from an exit opening 156 on
12 another side, much in the same manner as in the embodiments
13 described in conjunction with Figures 9 through 12. An internal
14 channel formed in any suitable manner (including, but not limited
15 to, the techniques described specifically above in conjunction with
16 Figures 1 through 4) is used to guide the line to a portion of the
17 central hub where it exits and follows a curved path 158 around a
18 portion of the circumference of the hub and then back to a channel
19 on the other side and out through the exit opening 156. The path
20 158 performs a similar function as the holes 144 or 146 in the
21 embodiment of Figure 12, or the holes 121 or 123 in the embodiment
22 of Figures 9 through 11. Clearly, a path similar to the path 158
23 could be formed on the other side of the central hub.

24 A variation of the embodiment shown in Figure 13 is shown in
25 Figure 14. The structure of the embodiment of Figure 14 is nearly
26 identical to the one shown in Figure 13, except that in inserting

1 a line 126 into the embodiment of Figure 14, the line is grasped at
2 its center point and each end is inserted downwardly through an
3 opening 160 (similar to the opening 24 of the embodiment of Figures
4 1 through 4) on opposite sides of the central hub 152. The two
5 ends of the line then are drawn outwardly through the openings 156
6 to cause the bight in the line to follow a curved path 162 located
7 around the base of the upstanding hub portion 152, where it meets
8 the circular plate 150. The friction provided around the base of
9 the hub 152, between the holes 160, functions to securely hold the
10 line in place in the manner similar to that described above in
11 conjunction with Figures 9 through 12. Also, another path similar
12 to the path 162 could be formed on the other side of the hub.

13 The foregoing descriptions of various embodiments of
14 applicant's invention are intended to be illustrative and not as
15 limiting. Various changes and modifications will occur to those
16 skilled in the art to perform substantially the same function, in
17 substantially the same way, to achieve substantially the same
18 result, without departing from the true scope of the invention as
19 defined in the appended claims.
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